AN UPDATE OF ENVIRONMENTAL INDICATORS

YUKON STATE OF THE ENVIRONMENT INTERIM REPORT 2001

Yukon
Environment

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Acknowledgements

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About this Report

The Yukon *Environment Act* requires a state of the environment report to be completed once every three years, with interim reports in the intervening years. The focus of this interim report is to provide an update on a selected number of environmental trends and indicators from the main broad topic areas presented in previous State of the Environment Reports (i.e. Air, Water, Climate Change, Land, the Living World, etc.).

The purpose of State of the Environment (SOE) reporting, as outlined in the *Environment Act*, is to provide early warning and analysis of potential problems for the environment; to allow the public to monitor progress towards the achievement of the objectives of the *Environment Act*; and to provide baseline information for environmental planning, assessment and regulation.

The State of the Environment Report does not make recommendations, set policy, or present a report card on the environment. It does, however, provide us with important information to help us make the right decisions to build a sustainable economy and conserve a healthy environment.

This SOE Report is designed to answer four basic questions:

- What is happening in the environment?
- Why is it happening?
- Why is it significant?
- What are we doing about it?

Where possible, indicators should be used to answer these questions and demonstrate whether environmental changes are positive or negative.

Information from this report comes from a variety of sources, including the Yukon government (Environment, Community Services, Health and Social Services, Energy, Mines & Resources), the Government of Canada (Fisheries and Oceans Canada, Indian Affairs and Northern Development, Environment Canada), technical reports prepared by individual researchers, and Traditional Knowledge provided by Yukon First Nations Elders.

AIR QUALITY

What is happening?

- The Whitehorse air quality station monitors concentrations of carbon monoxide (CO), nitric oxides and Total Suspended Particulate Matter (TSP). In 2001, monitoring equipment was added to also measure ground level ozone and fine atmospheric particulates ($PM_{2.5}$) on a continuous basis.[1]
- Although gaps in historic data exist due to equipment failures, the available information suggests that Whitehorse air is generally quite clean in relation to the national air quality standards.
- Annual TSP averages continue to be well below the national annual maximum acceptable objective. However, there were two incidences in both 1998 and 1999 where the acceptable 24-hour level for TSP was exceeded.
- With the exception of 1998 and 2000, there has been a trend towards lower levels of carbon monoxide (CO) in Whitehorse air during the month of December in the past five years.
- Monitoring of nitric oxides has been sporadic, and there is not enough data on ground level ozone and fine atmospheric particulates ($PM_{2.5}$) at this point to make any justifiable conclusions on trends.

Why is it happening?

- Air quality is affected by pollution that largely comes from the combustion of fossil fuels in vehicles, homes, the generation of electricity and other industries.
- Wood smoke, soot and dust all contribute to TSP. Decreases in annual levels of TSP are most likely linked to improvements in woodstove efficiency, decreased dust levels due to more roads being paved, and lower fuel consumption during warmer winters.
- 24-hour periods when TSP levels are elevated, usually relate to ground-based temperature inversions which result in air stagnation.
- Years with decreased levels of carbon monoxide are likely linked to warmer weather, when less firewood is burned and vehicle engines are not kept running for extended periods of time.
- Ground level ozone forms when exhaust from vehicles reacts in the presence of sunlight with organic particles in the air.

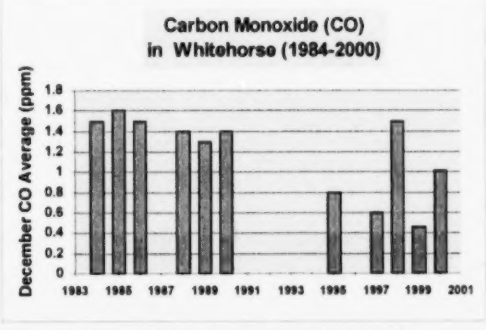
Why is it important?

- Scientists have observed a relationship between poor respiratory health and high levels of air pollution especially fine air particles ($PM_{2.5}$)[2] and ground level ozone.

What are we doing about it?

- National Ambient Air Quality Objectives (NAAQOs) have been established to provide a measure of protection to people and the environment from adverse effects due to airborne pollutants[2].
- The NAAQOs set out the maximum desirable, acceptable and tolerable levels for Carbon monoxide (CO), nitric oxide (NO) and total suspended particulates over 1 hour, 8 hour, 24 hour and 1 year time periods.
- The City of Whitehorse has enacted a bylaw that requires the use of low emission wood burning stoves (EPA approved) within city limits.

Source: Environmental Protection Series: National Air Pollution Surveillance (NAPS) Network: Annual Summary for 1998, (2000)



Source: Environmental Protection Series: National Air Pollution Surveillance (NAPS) Network: Annual Summary for 1998, (2000)

WATER QUALITY

What is happening?

- In Canada, the safety of drinking water has become a significant issue since the Walkerton tragedy and other incidences of contaminated water supplies (i.e. North Battleford).
- In Yukon both ground and surface water is generally plentiful and clean, but is sometimes locally or regionally polluted.
- One Yukon community (Carmacks) was issued a water advisory in 2001 due to unsatisfactory bacteriological results for a number of private wells.
- Piped water systems are thought to be of good quality, meeting both drinking water guidelines and bacterial standards throughout Yukon in 2001.
- In some communities (i.e. Watson Lake, Champagne) the parameters related to taste, color, smell or scaling properties were exceeded in 2001 but are not considered health risks.
- Not much is known about the Yukon's overall groundwater resources.

Why is it happening?

- Groundwater is the source for all community wells in Yukon except for the City of Whitehorse, which uses both surface and ground sources, and Carcross which uses surface water only.
- Water quality can be affected by three groups of contaminants that include toxic contaminants, sewage, and sedimentation.
- The placer mining industry is the single largest user of water whose impact is the release of sediment, causing turbidity in surface waters.

> *Long time ago you can drink water from anyplace, even snow.*
>
> Elder Charlie Dick
> - *Ross River Dena Council*

Why is it important?

- Contamination by microorganisms in sewage can cause a variety of diseases in people such as gastro-intestinal illness, hepatitis, and giardiasis.
- Metal contamination in drinking water is usually localized and can cause human and ecological health problems.

What are we doing about it?

- National drinking water guidelines have been developed and are used in Yukon to assess water quality.
- Piped water systems in Yukon are all chlorinated as are some of the truck delivery systems.
- All piped and trucked drinking water sources are monitored for chemical water quality at least annually and bacteriological assessments are completed on a biweekly or monthly basis.
- Currently an initiative is underway to provide a documentation and assessment of all community water supply systems including recommendations for upgrading.
- More emphasis is being placed on the monitoring of groundwater, especially near landfills and hardrock mines.
- The Department of Indian Affairs and Northern Development established its first groundwater observation well in 2001 which includes a water quality component. DIAND is also working on a multi-year groundwater study.
- Yukon Placer Mining industry is being regulated by the Yukon Placer Authorization that sets discharge sediment limits.

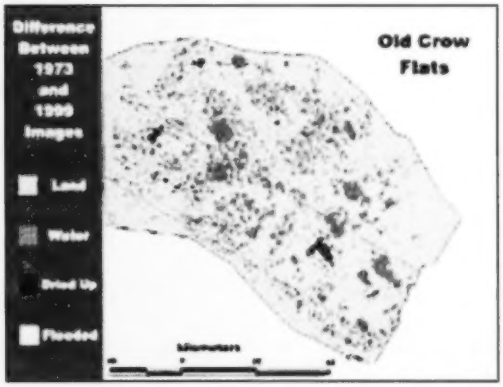
Total Reported Yearly Cases of Giardia in Yukon

Source: Government of Yukon, Yukon Communicable Disease Control Office, Whitehorse, Yukon

CLIMATE CHANGE

What is happening?

- Indicators that have been used in past State of the Environment Reports to demonstrate the evidence of climate change in the Yukon have included changes to air temperature, precipitation, vegetation, sea ice, melting permafrost and glacial activity.
- The satellite image below shows observed change in the water levels of ponds located in the Old Crow Flats over a 20 year period. The declines in water levels are linked to changes in precipitation which are thought to be related to climate change.[1]
- In 2001, Old Crow experienced an annual average temperature increase of 2.5°c from normals.[2] This was the greatest discrepancy experienced by any community in the territory for that year.
- The fall of 2001 was the 18th consecutive season of warmer temperatures in Canada making an unbroken streak of 4 ½ years, a phenomenon that has not been observed in Canadian weather patterns since records began.[3]
- Studies of both long and short time scales of the Yukon's climate history are needed to understand whether observed changes are related to weather anomalies or global warming.
- Climate Change models all suggest that the impacts of climate change are expected to be the most dramatic in Arctic regions.[4]



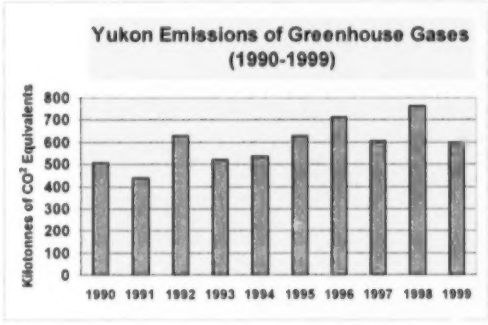
Source: Canadian Wildlife Service, Environment Canada

Why is it happening?

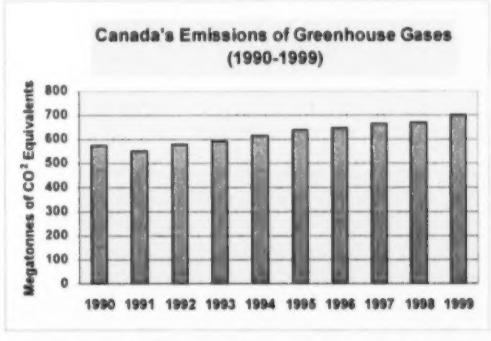
- The composition of the atmosphere is changing through the buildup of greenhouse gases, mostly carbon dioxide, methane and nitrous oxide.
- Yukon contributes less than 1/10 of a percent of Canada's yearly greenhouse gas emissions.
- In Canada the energy industries sector represents the largest contributor of greenhouse gas emissions at 44 percent.[5]
- In Yukon the transportation sector continues to be the largest contributor of greenhouse gas emissions at 47 percent in 1999.[6]

Why is it important?

- Global warming is thought to increase the frequency of severe weather events such as ice storms, floods and heavy snowfall; melt permafrost, and cause outbreaks of forest pests, diseases and wildfires.[7]
- Energy efficient residential and commercial buildings have been established.



Source: Department of Energy, Mines & Resources, Yukon government



Source: Pollution Data Branch, Greenhouse Gas Division, Environment, Canada

What are we doing about it?

- Canada has committed itself to reduce emissions of greenhouse gasses to 6 percent below 1990 levels or 185 megatonnes by the period between 2008 and 2012 under the 1997 Kyoto Protocol. Yukon is taking action to contribute to this national reduction target.[8]
- Yukon Government is in the process of developing a Yukon Climate Change Action Plan for reducing greenhouse gas emissions, addressing adaptation, promoting technology development, and enhancing public awareness.[9]
- Yukon initiatives to curb greenhouse gases include the addition of a second wind turbine on Haeckel Hill and providing hydroelectric power to Dawson City to offset diesel generation. The second wind turbine will enhance the Yukon's wind generation capacity by 440% and the transmission line to Dawson will displace 40% of all diesel electric generation in the territory and annually eliminate between 9.8 to 16.8 kilotonnes of carbon dioxide.[10]
- The Yukon government, in partnership with federal government departments, has put in place numerous programs related to public education and awareness, technology development and the promotion of energy conservation within residential, commercial, and government buildings. Some of the more recent initiatives include:
  - The opening of the Canada/Yukon Energy Solutions Centre in the spring of 2001 to provide technical services and facilitate efficiency and renewable energy solutions for commercial, First Nation, government, and residential clients.
  - The Community Wind Resource Assessment Program which is identifying and assessing the potential of various sites throughout the Yukon to support commercial scale wind development.
  - The Yukon Hydrogen Project which is looking into the feasibility of producing and storing hydrogen as an alternative energy source using the surplus hydro electricity from the Whitehorse-Aishihik-Faro grid.

ATMOSPHERE

What is happening?

- Stratospheric ozone protects life on earth from the sun's damaging ultraviolet radiation and stabilizes the earth's temperature.
- Over the past 20 years, stratospheric ozone concentrations have declined in excess of 10 percent per decade[1]. There have also been short-term periods of severe stratospheric ozone depletion.
- With the thinning of the stratospheric ozone layer, more of the sun's ultra violet (UV) rays can now reach the earth's surface.
- UV radiation is greatest at midday when the sun is highest in the sky. Because of its high latitude, typical summer midday UV-B values in the Yukon are much lower than southern jurisdictions (usually in the low to moderate range).

What does the UV Index really mean?

UV Index	*Category*	*Sunburn Time*
over 9	extreme	less than 15 minutes
7-9	high	about 20 minutes
4-7	medium	about 30 minutes
0-4	low	more than 1 hour

Source: Environment Canada's Green Lane, Living with Ultraviolet

The UV Index: Typical summer midday values

Tropics	10 (extreme)
Toronto, ON	8.0 (high)
Halifax, NS	7.5 (high)
Edmonton, AB	7.0 (high)
Yellowknife, NWT	6.0 (moderate)
Iqualuit, NWT	4.8 (moderate)
North Pole, AK	2.3 (low)

Source: Environment Canada's Green Lane, Living with Ultraviolet Fact Sheet

Why is it happening?

- The release of chlorofluorocarbons (CFCs) into the atmosphere has lead to a depletion of the stratospheric ozone layer. CFCs were manufactured for use in air conditioning systems such as refrigerators.
- Since the manufacturing and use of CFCs has been curtailed, global atmospheric concentrations are not increasing.
- The reductions of CFC's alone may not be enough to restore the Arctic ozone layer to pre-1980's levels.[1]

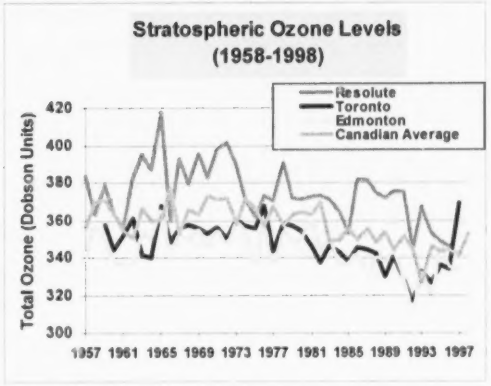
Why is it important?

- The ozone layer protects us by absorbing much of the sun's ultraviolet radiation which may cause skin cancer, deforestation, reduce crop yields, damage aquatic life and increase eye disease.

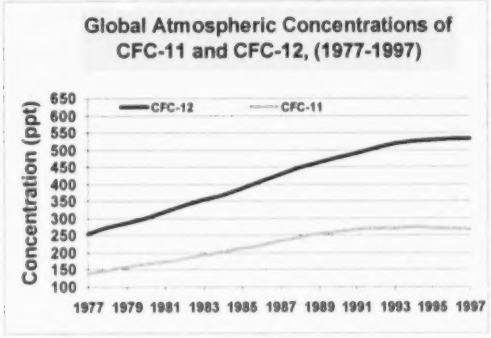
What are we doing about it?

- The Montreal Protocol agreement of 1989 has resulted in a stepwise reduction and eventual production phase out of various ozone depleting substances.
- The production phase-out of CFC's in Canada was completed on December 31, 1995.
- In Yukon regulations that govern the use and disposal of ozone depleting substances were passed in 1996 and amended in 2000.
- A environmental awareness training program for people servicing refrigerators and air-conditioning equipment has been set up by a Federal/Provincial Working Group and 106 Yukon technicians have taken the course and 24 are permitted.[2]

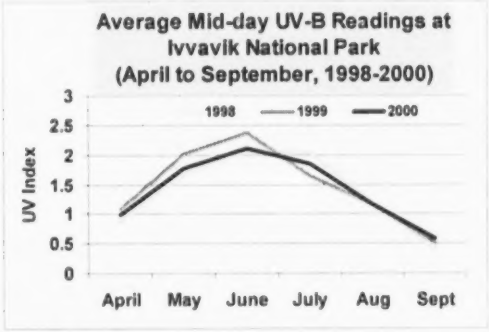
> *For years snow is the best water you can get. Now you can't even take snow water, the air too much polluted.*
>
> Elder Charlie Dick
> *- Ross River Dena Council*



Source: Canadian source: Atmospheric Environment Service, Environment Canada, Downsview, Ontario, Canada.



Source: Canadian source: Atmospheric Environment Service, Environment Canada, Downsview, Ontario, Canada



Source: Environment Canada, Meteorological Services, Edmonton, Alberta

CHANGES ON THE LAND

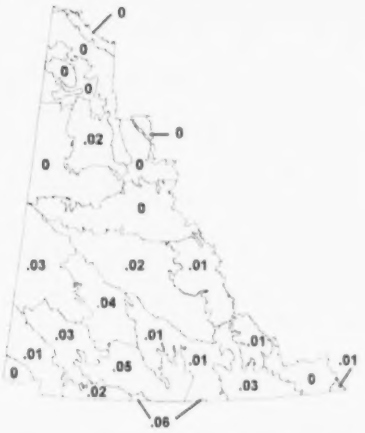
What is happening?

- Expansion of the road network over the past 50 years has led to fragmentation of wildlife habitat.
- Habitat fragmentation occurs when roads transform previously large contiguous habitat patches into smaller ones while also contributing to development in formerly remote inaccessible areas.
- Increased road access into remote areas can also lead to the decline in some fish and wildlife populations due to over harvesting.
- Since the completion of the Alaska Highway in 1945 roads have been built that connect all Yukon communities except for Old Crow which is accessible by winter road only.
- Currently there are approximately 8,100 kilometers of highways (class 1), 2 wheel drive all season (class 2) and 4 wheel drive roads (class 3) in Yukon.[1]
- Forty-four percent are highway roads (Class 1).
- Seismic lines, tote roads, winter roads, power lines, logging roads, trails and footpaths are currently not inventoried.

Yukon Road Network
(includes only all weather highways, two and four-wheel drive roads)

Source: Government of Yukon, Department of Environment, GIS section

Yukon Road Densities (km/km²) by Ecoregion



Source: Government of Yukon, Department of Environment , GIS section

Why is it happening?

- Forestry, mineral, gas and oil activities are a major factor in the creation of new roads.
- Interest has increased in oil and gas development in the Eagle Plain, Peel Plateau and Liard Plateau areas of the Yukon.[2]
- Yukon mineral exploration and deposit appraisal expenditures are currently low compared to the mid 1990's and are estimated at 10.7 million for 2001.[3]

> *Development has taken on a role that has no regard for the traditional lifestyle of native people*
>
> - Robert Lee Jackson
> *- Traditional Knowledge Coordinator - CYFN*

Why is it important?

- Loss and isolation of natural habitat through habitat fragmentation is a risk to wildlife and biodiversity at both a global and regional scale.

What are we doing about it?

- The affects of habitat fragmentation are taken into consideration in environmental land use assessment and planning processes.

CONTAMINANTS IN THE ECOSYSTEM (Wildlife)

What is happening?

- Studies have shown that man-made organochlorine contaminants are generally low in Yukon wildlife.
- Monitoring has shown that both metal and organochlorine contaminants are not at high enough levels to be a major health concern to people or affect wildlife.[1]
- Some types of metals (cadmium) while generally low, can occasionally be elevated in Yukon wildlife.
- Cadmium has been found in high levels in the liver and kidneys of some Yukon wildlife, but this comes from natural sources.

Why is it happening?

- Persistent organochlorine contaminants can be transported through air currents and be deposited long distances away from where they originated.
- Contaminants usually enter animals by consumption of food and water.
- Some contaminants are known to concentrate more in animals at the top of the food chain (biomagnify).
- Some contaminants increase in concentration in the animal as it gets older (bioaccumulation).

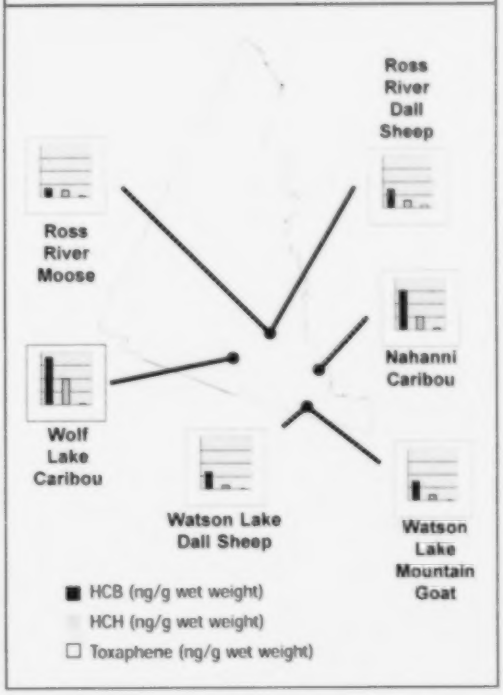
Why is it important?

- While many metals are essential in the functioning of plants and animals, elevated levels in the environment can cause human health problems and affect the ecosystem.
- Organochlorine contaminants are not found naturally and can cause health effects to humans and affect the ecosystem.

What are we doing about it?

- Recommended consumption levels of contaminants in food have been set to minimize health risks.[2]
- In 2001, Canada ratified the Stockholm Convention on Persistant Organic Pollutants (POPs). This global treaty is designed to reduce and/or eliminate the use of POPs.

Organochlorines in Animal Fat



Source: Department of Indian and Northern Affairs, Northern Contaminants Program Whitehorse, Yukon

Yukon Recommended Kidney and Liver Consumption Levels

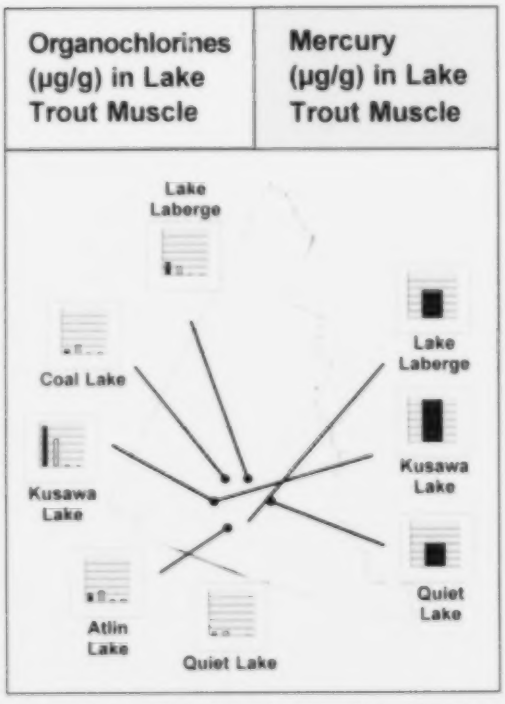
Animal	*Kidneys per year*	*Livers per year*
Caribou		
Bonnet Plume	32	16
Nahanni	28	13
Procupine	25	12
Forty-Mile	20	12
Wolf Lake	15	8
Finlayson	0	5
Tay	7	4
Moose	1	1
Sheep	178	No limit
Goat	382	25

Source: Yukon Health and Social Services Health Advisory, 1997

CONTAMINANTS IN THE ECOSYSTEM (Fish)

What is happening?

- Studies have shown that man-made organochlorine contaminants and some types of metals, while generally low, can occasionally be elevated in Yukon fish.
- Kusawa Lake had the highest levels of mercury where 97 percent of all the lake trout muscle samples taken (1993-1998) had mercury concentrations that exceeded the guideline level of 0.20 µg/g recommended for fish used for subsistence.[1]
- An observed decline of organochlorine contaminants and mercury concentrations in Lake Laberge fish has occurred since closure of the commercial fishery and the issuance of a health advisory in 1991.[1]
- A new set of organochlorine componds called 'polybrominated diphenyl ethers (PBDEs)' are beginning to appear in arctic ecosystems.
- Many arctic monitoring programs have shown that the global reduction in the use of organochlorines is resulting in a decline in concentrations in arctic ecosystems.



Source: G. Stern DFO, Freshwater Institute, Winnipeg Manitoba

Why is it happening?

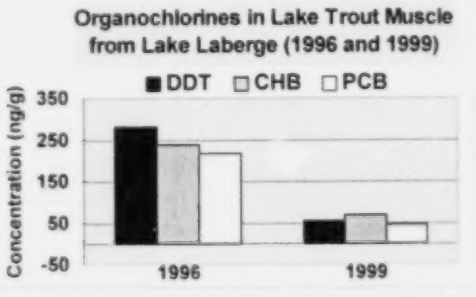
- Persistent organochlorine contaminants can be transported through air currents and be deposited long distances away from where they originated.
- Contaminants can enter aquatic food chains and can be stored in fish that are eaten by people.
- Some contaminants are known to concentrate more in animals at the top of the food chain (biomagnify).
- Some contaminants increase in concentration in the animal as it gets older (bioaccumulation).
- PBDEs have been used in various commercial products since the 1960s as a fire retardant. They arrive in the Yukon in the same manner as other organochlorines - through long-range atmospheric transport.

Why is it important?

- While many metals are essential in the functioning of plants and animals elevated levels in the environment can cause human health problems and affect the ecosystem.
- Organochlorine contaminants are not found naturally and can cause health effects to humans and affect the ecosystem.

What are we doing about it?

- In 2001, Canada ratified the Stockholm Convention on Persistant Organic Pollutants (POPs). This global treaty is designed to reduce and/or eliminate the use of POPs.
- Further study is underway to determine inter-annual variability as well as inter-lake variability of organochlorine contaminants in fish in Lake Laberge.
- A high volume air sampler is going to be set up at Fox Lake to measure incoming contaminants.



Source: G. Stern DFO, Freshwater Institute, Winnipeg Manitoba

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